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Abstract

Background. Increasing rates of both primary and repeated caesarean birth (CS) are an issue of international concern as they can impact negatively on maternal and fetal morbidity and mortality. Increasing rates of both primary and repeated CS birth are an issue of international concern as they can impact negatively on maternal and fetal morbidity and mortality.

Aim. The aim was to explore morbidity and mortality relating to repeat CS in Jordan

Method. A retrospective cohort study was conducted in two large public hospitals, with data collected on repeat caesarean birth outcomes for mothers who gave birth in the North of Jordan from June 2005 to June 2010. A specifically designed abstraction form was used to collect demographics social data and maternal and infant intranatal and postnatal outcomes. The instrument was subjected to several reviews carried out by the investigators and a pilot study was conducted to ensure specificity and clarity. All women who had multiple repeated CS were divided into two groups, women who had three CS and women who had four CS and more, in order to compare the incidence of maternal and neonatal morbidity and mortality rates. Ethical approval was granted from the Human Subject Committee at Jordan University of Science and Technology. This study was funded by Jordan University of Science and Technology.

Results. The total sample consisted of 265 women; the majority had three previous CS (n=175, 66%), while 66 (25%) had four CS, 22 (8.3%) had five CS, one (0.4%) had six CS, and one (0.4%) had seven CS. A total of 42 women (15.8%) had adhesions, 28 (10.6%) had placenta praevia, 23 (8.7%) needed blood transfusion, 18 women (6.8%) had a hysterectomy, 10 women (3.8%) suffered uterine rupture, two women (0.8%) had placental abruption, two women (0.8%) had bladder injury, and two women (0.8%) developed disseminated intravascular coagulopathy (DIC). Compared with group of women with three previous CS, the group of women with four CS and more had a significantly higher mean age, lower mean for gestational age, increased need for blood transfusion and were more likely to experience placenta praevia.

Conclusion and implications. Multiple repeated CS pose potentially serious risks for maternal and neonatal health, which increase with the rising number of repeated CS. Therefore, women should be fully informed about the serious risks of multiple repeated CS and should be offered proper counselling by GP or obstetrician and midwives for vaginal birth after CS, where appropriate. Where possible, there is also a need to prevent the first CS

Key words: caesarean delivery, multiple repeated caesarean delivery, maternal morbidity, neonatal morbidity, retrospective study, Jordan, Middle East, evidence-based midwifery

Introduction

Thirty years ago, the World Health Organization (WHO) stated that 'it is not justified in any place in the world to perform CS operations at a rate greater than 5% to 15%' (WHO, 1985: 436-37). A recent conclusion from the WHO stated that 'at population level, CS rates higher than 10% are not associated with reductions in maternal and newborn mortality rates' (WHO, 2015: 1-8). Nevertheless, the rate is now higher than the upper limit of 15% recommended by the WHO in both developed and developing countries (Martin et al, 2012; Lumbiganon et al, 2010). For example, Brazil has the highest CS rate in the world. In the private sector, which accounts for one fourth of all birth, the rate of CS was close to 80%, while in the public sector it was approximately 28% (Potter et al, 2008).

The overall CS rate in the US was 32.8% of all births in 2010 (Martin et al, 2012), and the overall rate of CS was 27.3% for selected facilities in Latin America, Africa in 2004-2005 and in Asia in 2007-2008 (Lumbiganon et al, 2010). The Arab world was no exception for the increase of CS rate. For example, the overall rate of CS in Egypt was 27.6% (El-Zanaty and Way, 2009), and 30.3% in Jordan (Al Rifai, 2014).

Although, there is a consensus, which has been documented in many international guidelines, such as the Green Top Guidelines (RCOG, 2015), that planned vaginal birth after caesarean section (VBAC) is a clinically safe choice for the majority of women with a single previous lower segment caesarean delivery, the rate of repeated caesarean has increased to a fourth of all deliveries (Clarke et al, 2015; Hamel, 2007).

Lyell (2011) explained the escalation in the repeated CS rate by noting the sharp decline to less than 10% of planned VBAC. This means, therefore, that more than 90% of women who had primary CS will experience repeated CS in subsequent pregnancy.

Despite medical advances and increasing access to improved obstetric care across the globe, CS deliveries are still more risky for both mother and baby. The literature has identified that repeated CS causes increased risk of maternal and neonatal morbidity and mortality. For mothers, these may include uterine scar rupture, injuries to surrounding structures, placenta site abnormalities, adhesions, excessive blood loss, embolism and hysterectomy (Lyell, 2011). Problems for the neonate include lower gestational age, preterm birth, lower Apgar scores, admission to neonatal intensive care unit and death (Gedikbasi et al, 2010; Rashid and Rashid, 2004).

Unfortunately, the increasing rates of repeated CS in Jordan have mirrored the increasing rates of maternal and newborn morbidity and mortality. This is against the focus of the 2000 Millennium Development Goals (MDGs), in particular MDG5, which explicates an international commitment to improve maternal mortality health.

Background

Significance of the study

Previous CS is the most common indication for a repeated CS and accounts for more than one-third of all births by CS (Guise et al, 2010). In Jordan, there were no available statistics, but it was reported from previous studies that repeated CS accounted for more than one third of all births (Alchalabi et al, 2007; Amarin et al, 2006). Repeated CS is a significant issue, particularly in countries where large families are encouraged for social and cultural reasons (Rashid and Rashid, 2004; Abu-Heji and Zayed, 1998).

Jordan has a high maternal and neonatal mortality rate compared to more developed countries. Their maternal mortality rate (MMR) was 58 per 100,000 and the infant mortality rate (IMR) was 14.7 per 1000 live births in 2015, which is significant higher than countries such as the UK and the US with an MMR of 9:100,000 and 14:100,000, respectively (WHO, 2015). Despite medical advances and increasing access to improved obstetric care across the world, CS represents a serious challenges to health care systems, because of serious concerns over safety and the high costs.

In this context, repeated CS creates a particular threat for Jordanian mothers and their babies, as Jordan is a country where resources are limited and the economy is unstable (World Bank, 2016). Assessing maternal and neonatal morbidity and mortality related to repeated CS will highlight the current practices in Jordan and help to inform the development of guidelines for counselling and managing women with previous CS regarding their decision about planned repeated CS or VBAC.

Furthermore, it may encourage the government to be more committed to providing education to health professionals and mothers, and to supporting the implementation of evidence–informed guidelines. This study was deemed necessary as the data is needed to help health professional and policy makers in order to estimate the size of the problem, following which benchmarks can be established in order to set future public health targets.

Research problem

CS rates in Jordan were around double that recommended by the WHO (Al Rifai, 2014). Previous Jordanian studies showed that in total repeated CS accounted for more than one third of all births (Alchalabi et al, 2007; Amarin et al, 2006). The rising rate of repeated CS deliveries and also the high rate of maternal and neonatal morbidity and mortality in Jordan prompted the authors to investigate the impact of repeated CS on fetal and maternal health in a Jordanian population.

Aim

Our study aimed to assess maternal and neonatal morbidity and mortality in two large public referral hospitals in the North of Jordan from June 2005 to June 2010. It also aimed to compare the incidence of maternal, neonatal morbidity and mortality rates between women who had previous three caesarean section, and women who had four CS and more

This study was designed in order to answer the following research questions:

- What are the maternal morbidities that arise from multiple repeated CS?
- What are the neonatal morbidities that arise from multiple repeated CS?
- Are there any differences in the incidence of maternal and neonatal morbidity and mortality between women who had three previous CS, and women who had four or more previous CS?

Literature review

A structured literature search was conducted to identify the evidence concerning repeat CS birth and maternal neonatal morbidity internationally and, more specifically, in Jordan. The following databases were explored: MEDLINE (2005 to present); Cumulative Index to Nursing Allied Health literature plus full text (CINAHL) (2005 to present); Academic One File information (2005 to present); Science Direct (2005 to present); and also Cochrane Database of systematic review.

The key words used for the search strategy were ‘repeat caesarean section’, and/or ‘multiple repeated caesarean section’, ‘high order caesarean section’; these were combined with ‘pregnancy outcomes’, ‘maternal morbidity’, ‘complications’, ‘neonatal morbidity’, ‘mortality’ and subsequently combined with ‘Northern Jordan’, ‘Jordan’, ‘Middle East’. The selected language was English and the inclusion criteria were: undertaken in Middle Eastern countries, repeat CS, and included data on neonatal and maternal morbidity and mortality.

The search strategy identified a total of 71 papers. From these 71 papers (49 from Medline/CINAHL and 16 from Science Direct) a total of 43 abstracts were reviewed independently by the authors and 22 were excluded. A total of 21 were then selected for full review. The literature review on those 21 papers identified tends to demonstrate patterns of consistency and repetition of the methodology with regard to the evaluation of maternal and neonatal morbidity and mortality resulted from repeated CS.

These 21 studies compared maternal and neonatal morbidity and mortality with regard to the number of previous CS. Those studies used descriptive, observational and case control design for assessing maternal and neonatal morbidity in relation to the number of previous CS. The 21 studies were from different cultures, including the US, Australia,the UK, Israel, Kingdom of Saudi Arabia and also Jordan.

Within those 21 studies, maternal morbidity identified were hysterectomy, uterine scar rupture, hemorrhage, adhesions, surgical injury, perioperative infections, wound complications and abnormal placentation (including placental abruption, praevia, and accrete). Neonatal outcomes were: respiratory morbidity, gestational age, Apgar score, antepartum death after previous CS. Sample size ranged between 277 and 30,132.

The majority of reviewed studies were consistent in their findings, which included higher rates of haemorrhage, blood transfusion, adhesions, and surgical injury increased with increasing number of multiple previous CS (Marshall et al, 2011; Gedikbasi et al, 2010; Ma et al, 2009; Tulandi et al, 2009; Hamel, 2007; Nisenblat et al, 2006; Silver et al, 2006).

Furthermore, a literature review of those 21 studies reported the following maternal morbidities: Dense adhesion and uterine rupture (Marshall et al, 2011; Gedikbasi et al, 2010; Ma et al, 2009; Tulandi et al, 2009; Hamel, 2007; Nisenblat et al, 2006), infections and wound complications, need for blood transfusion (Lyell, 2011; Gedikbasi et al, 2010), bladder injury (Gungorduk et al, 2010), bowel injury and obstruction, hysterectomy, increased incidence of placenta praevia from 10/1000 to 28/1000, which increased the risk of placenta accreta (Marshall et al, 2011; Silver et al, 2006), longer operation time, and increase length of hospital stay, and delays in delivery (Gedikbasi et al, 2010).

While those for neonates were difficult delivery of neonate, an increased admission to the neonatal intensive unit and an increased frequency of respiratory problems, shorter mean gestational age, lower Apgar score, and higher number of fetal death (Gedikbasi et al, 2010; Tulandi et al, 2009).

In Jordan, two descriptive published studies were identified documenting maternal morbidity in women with repeated CS. The first study carried out by Amarin et al (2006) investigated the complications specifically related to repeated CS among three hospitals (national, military, and university) from 1999 to 2004. The results showed that there was a statistically significant difference among the three hospitals in the number of previous CS, failure to progress in labor and other indications for CS. Regression analysis revealed that women from military and university hospitals were more likely to have placenta praevia. The second study, undertaken by Alchalabi et al (2007), evaluated the maternal complications resulting from repeated CS by using 1739 women's records, including women with no previous CS, from 2000 to 2001. This revealed a fourteen fold increase in the risk of caesarean hysterectomy for women with placenta praevia and previous CS compared to women with placenta praevia and no previous CS.

In summary, the literature indicated that multiple repeated CS increases the incidence for maternal and neonatal morbidity and mortality.

Method

A retrospective cohort study was conducted to collect data about maternal and neonatal morbidity and mortality from multiple repeated caesarean sections.

Data collection method

A data abstraction form was used that focused on demographic and social data, maternal and infant intranatal and also postnatal outcomes. This abstraction form was subjected to several reviews by the investigators (one senior obstetrician, one senior neonatologist and two senior midwives) and a pilot study was conducted to ensure specificity and clarity. It was developed to assess maternal and neonatal outcomes and facilitate comparison between the two groups of women: those who had three previous CS, and women who had four or more previous CSs. Morbidity measures included uterine rupture, anaemia, blood transfusion, infection bladder and ureter injury, placenta praevia, placenta accreta, damage to internal organs, hysterectomy, deep vein thrombosis, pulmonary embolism and death. Fetal morbidity data were collected on gestational age, birth weight, Apgar scores resuscitation, admission to neonatal intensive unit, respiratory distress syndrome, infection and death.

The total number of data abstraction forms available for analysis was 265. Some variables were coded on an ordinal scale, such as degrees of placenta praevia. Some questions were on ratio scale such as the amount of blood transfusion, gestational age, birth weight, Apgar scores and resuscitation. Some questions were coded on nominal scale, such as type of adhesions and type of rupture uterus. Other questions were binary response questions, such as the need for blood transfusion, or infection of the wound. Dichotomous variables that indicate whether maternal and neonatal complications happened during surgery were used in the analysis and these were coded as (0) absent (1) present, such as presence of placenta accreta, presence of placenta abruption, deep vein thrombosis, pulmonary embolism, ureter injury, bladder injury, hysterectomy and death.

Data collection procedure

After obtaining approval for conducting the study, two qualified research assistants from the maternity department collected the data from multiple repeated CS women's health records, one from Bade'a hospital and the other from King Abdullah University Teaching hospital (KAUH). All maternal and fetal health records were allocated with the assistance of the administrators of health records in both hospitals. The research assistants completed the data abstraction forms. Data on maternal and neonatal morbidity and mortality were extracted manually from Bade'a hospital and electronically from KAUH. Data entry checks were performed.

Setting

The two settings were chosen as both hospitals were central referral teaching hospitals in the north of Jordan with

(57,110) births per year. Both hospitals provide maternity services to all women who are residents in the north and act as tertiary centres for women who are diagnosed as having a high risk of pregnancy, from all peripheral hospitals in the north. KAUH provides maternity health services for all women who have health insurance or who can pay as a private patient, while Bade'a hospital is a public hospital providing free maternity health services for all women.

Sample

The population of the study was all women who had CS in the two major teaching hospitals in the north of Jordan during a period of five years from June 2005 to June 2010. The sample for this study comprised all women who had multiple repeated CS of three of more.

Data analysis plan

Data were entered by the researchers and analysed using SPSS software version (17). Descriptive statistics including frequency, mean and SD were presented for the total sample. Inferential statistics, chi-square and independent t-test, were used to compare between groups as appropriate. Chi-square test was used to compare categorical variables while independent t-test was used to compare between continuous variables. The number of previous CS was used as comparator between groups (previous 3CS and previous more than 4CS). We used three previous CS, because the policy in both hospitals is to perform elective CS on patients who have had two or more previous CS deliveries between 37 and 38 weeks of gestation, unless there are other indications for early delivery. Moreover, many previous studies had used previous 3 CS as a control group for comparisons to determine if there is an increased incidence of maternal and neonatal morbidity and mortality with the increase in the number of previous CS.

Ethical issues

Prior to the data collection phase, approval to conduct the study was obtained from the Human Subject Committee at Jordan University of Science and Technology. The Ministry

Table 1a: Comparative outcomes for Jordanian women with 3 or more CS births

Variable	Women with previous 3 C/S 175(66%)		Women with 4 C/S and more 90 (34%)		Total 265 (100%)		P value
Working status	66(39.5%)		26(29.9%)		92(36.2%)		0.17
General anesthesia	165(94.3%)		87(96.7%)		252(95.1%)		0.56
Presence of placenta previa	13(7.4%)		15(16.7%)		28(10.6%)		0.04*
Type of placenta previa (within placenta previa women)	Grade1	1(7.7%)	Grade1	0(0%)	Grade1	1(3.6%)	0.65
	Grade2	5(38.5%)	Grade2	7(46.7%)	Grade2	12(42.9%)	
	Grade3	6(46.2%)	Grade3	7(46.7%)	Grade3	13(46.4%)	
	Grade4	1(7.7%)	Grade4	1(6.7%)	Grade42	(7.1%)	
Presence of adhesions	24(13.7%)		18(20%)		42(15.8%)		0.25
Type of adhesions (percentages are within women who have adhesions)	Thin	3 (13%)	Thin	0 (0%)	Thin	3 (7.3%)	0.24
	Thick	20(87%)	Thick	18(100%)	Thick	38 (92.7%)	
Rupture uterus	6 (3.4%)		4 (4.4%)		10 (3.8%)		0.74
Type of uterine rupture (percentages are within the women who develop uterine rupture)	Dehiscence	3 (50%)	Dehiscence	2(50%)	Dehiscence	5(50%)	NA
	Incomplete	3 (50%)	Incomplete	1(25%)	Incomplete	4(40%)	
	Complete	0 (0%)	Complete	1(25%)	Complete	1(10%)	

** means significant; NA means p value was not reported*

of Health and the director of King Abdullah University Hospital also gave permission for the study. The data were kept in a closed cabinet, where no one but the research team could access the files. The data abstraction form was anonymous, as no name or identification information were required. However, all information obtained by the data collectors was kept confidential and the researchers did not have access at any personal or identifiable details of any of the participants selected.

Results

During data collection, the total number of deliveries at KAUH was 8424 and the CS number was 2475; the rate of CS was 29.4%. The total number of deliveries at Princess Bade'a hospital was 48686 and the CS number was 16228; the rate of CS was 33.3%. Further analysis showed that Bade'a hospital had higher proportions (37%) of four previous CS (KAUH: 30.8%). The rate of CS in both hospitals was 32.7% (18703). The rate of three or more previous CS, which form all multiple repeated CS, was 15% (2805), while the rate of three or more repeated previous CS from the total CS in both hospitals was 1.4%.

Mortality data for mothers and babies

During the data collection period, there were two maternal deaths (0.6%). The causes of death were pulmonary embolism in one case and prolonged shock and multisystem failure in the other. Seven infant deaths (2.7%) were reported, the causes of fetal death were respiratory distress syndrome in four cases and congenital abnormalities in three cases.

Demographic profile of the sample

The total sample was 265 women's files from both hospitals (3 previous CS and 4+ previous CS). Women were aged between 20 and 45 years (Mean=33.1, SD=5.2); one third of them (34.7%, n=92) were working, while the rest (65.3%, n=173) were housewives. The total sample gravidity ranged between three and 16 pregnancies (mean=5.4, SD=2.3) and parity ranged between three and 10 deliveries (mean=4.5, SD=1.6). Around two third of the sample (66%, n=175) had three previous CS, while 25% (n=66) had four CS, 8.3% (n=22) had five CS, 0.4% (n=1) had six CS and 0.4% (n=1) had seven CS. Six women (2%) had twin pregnancy. Around 60% of the sample's babies were male and 40% were female. All the second twin babies (n=5) were males.

Table 2. Independent t-test for gestational age, birth weight, APGAR score at one and five minutes and length of stay

Variable	Women with previous 3 C/S 175(66%)	Women with previous 4 C/S90 (34%)	Total 265 (100%)	P value
Hysterectomy	12(6.9%)	6(6.7%)	18(6.8%)	1
Presence of DIC	2 (1.1%)	0 (0%)	2 (0.8%)	0.55
Bowl injury	0(0%)	1(1.1%)	1(0.4%)	.34
Ureter injury	0(0%)	0(0%)	0(0%)	A
Bladder injury	1(0.6%)	1(1.1%)	2(0.8%)	1
DVT	1(0.6%)	1(1.1%)	2(0.8%)	1
Pulmonary emb	0(0%)	1(1.1%)	1(0.4%)	.34
Mother admission to ICU	1(0.6%)	1(1.1%)	2(0.8%)	1
Mother death	1(0.6%)	1(1.1%)	2(0.8%)	1
Infection of the wound	3 (1.7%)	2(2.2%)	5(1.9%)	1
Receiving of blood transfusion	9 (5.1%)	14 (15.6%)	23(8.7%)	0.009*
Presence of placenta accrete	0(0%)	0(0%)	0(0%)	A
Presence of placenta abruption	0(0%)	2(2.2%)	2 (0.8%)	0.11

** means significant; A means that no statistics are computed because item is a constant.*

Description of maternal and neonatal morbidity for the total

Adhesions: results according to surgeon notes showed that 42 women (15.8%) had adhesions, and thick adhesions was the common for these cases (90.5%, n=38 out of 42). Only a minority of women 7.1% (n=3) had thin adhesions. Further breakdown of the data showed that the incidence of thick adhesions was almost similar in both groups: women who had three previous CS 87% (n=20) and women who had four CS and more 92.7% (n=18).

Placenta praevia: results according to case notes showed that 10.6% (n=28) had placenta praevia; the most common type of placenta praevia was grade two and grade three (12: 42.9%; 13: 46.4%, respectively); two women (7.1%) had grade four and one woman had grade one (3.6%). It also showed that women with four CS and more accounted for higher proportion of placenta praevia incidence 16.7% (n=15), compared to 7.4% (n=13) women with previous three CS.

Blood transfusion: results according to case notes showed that 23 women (8.7%) had blood transfusion. Further breakdown of the data showed that women with four CS and more required more blood transfusions 15.6% (n=14), compared to 5.1% (n=9) women with three CS.

Ruptured uterus: results according to case notes showed that 10 women (3.8%) had rupture uterus; the most common type of rupture uterus was dehiscence and incomplete rupture (5: 50%; 4: 40%, respectively), It also

Table 3. Independent t-test for gestational age, birth weight, APGAR score at one and five minutes and length of stay between the two groups (3CS and 4CS and more)

	Group number	N	Mean	Std. Deviation	T	P
Gestation age in weeks	previous 3CS	173	37.31	1.43	2.29	0.023*
	previous 4 CS and more	86	36.85	1.68		
Birth weight in kg	previous 3CS	172	3.05	.46	1.32	0.19
	previous 4 CS and more	86	2.96	.57		
APGAR score at one minute	previous 3CS	173	6.77	1.56	- 0. 08	0.94
	previous 4 CS and more	86	6.80	1.35		
APGAR score at five minutes	previous 3CS	173	8.58	1.71	-0.21	0.83
	previous 4 CS and more	86	8.63	1.25		
Length of stay in neonatal intensive care unit	previous 3CS	28	6.43	5.22	- 1.5	0.15
	previous 4 CS and more	16	12.44	15.6		

** significant*

showed that women with three previous CS accounted for the majority of dehiscence and incomplete ruptured uterus 60% (six out of 10).

Hysterectomy: results according to case notes showed that 18 women (6.8%) required hysterectomy. Further breakdown of the data showed that almost equal proportions of women required hysterectomy in the two groups' (previous 3CS 6.9% (n=12), previous 4CS and more 6.7% (n=6).

Other maternal morbidity

Results according to case notes showed that all cases of placenta abruption 2 (0.8%), bowel injury 1 (0.4%) and pulmonary embolism 1 (0.4%) were in women with four CS and more. It also showed that almost equal proportion in the two groups (previous three CS and previous four CS and more) for other morbidity such as bladder injury, 2 (0.8%) presence of disseminated intravascular coagulopathy (DIC) 2 (0.8%), deep vein thrombosis (DVT) 2 (0.8%), mother admission to intensive care unit (ICU) 2 (0.8%) and maternal death 2 (0.8%).

Demographics

An independent t-test was conducted to compare the women age for the two groups (three CS and four CS and more). There was a significant difference in women's age for three CS (M=32.4, SD=5.05) and four CS and more (M=34.4, SD=5.3; t(265)= -2.98, p=0.003). On the other hand, a chi-square test was conducted to compare the working status for the two groups (three CS and > four CS). There was no significant difference in working status between proportions of women who had three CS and proportions of women who had four CS and more. See Table 1 and Table 2.

Morbidity and mortality for mothers

An independent t-test was conducted to compare the amount of blood transfusion in ml between the two groups (three CS and four CS and more). There was no significant difference in amount of blood transfusion between the two groups. Chi-square tests were conducted for categorical variables to compare the type of anesthesia, receiving of blood transfusion, wound infection, presence of placenta praevia (PP), grade of PP, placenta abruption, placenta accrete, adhesions, type of adhesions, presence of DIC, ruptured uterus (including types), bowel injury, ureter injury, bladder injury, hysterectomy, DVT, pulmonary embolism, mother admission to ICU, and maternal death for women who had three previous CS and women who had four CS and more.

Findings showed that the proportion of previous three CS women who received blood transfusion (n=9, 5.1%) was significantly different from the proportion of four CS and more women who received blood transfusion (n=14, 15.6%). Furthermore, the proportion of three CS women who had placenta praevia (n=13, 7.4%) was significantly different from the proportion of who had placenta praevia (n=15, 16.7%) in women who had four CS and more. There were no significant differences in type of anesthesia, infection, type of placenta praevia, placenta abruption, placenta accreta, adhesions, DIC, ruptured uterus, bowel, bladder or

Table 4. chi-square tests for babies' categorical variables

Variable	Women with previous 3 C/S 175(66%)		Women with 4 C/S and more 90 (34%)		Total 265 (100%)		P value
Baby Gender	Male	104(60%)	Male	51(58.6%)	Male	155(59.6%)	0.92
	Female	69(39.9%)	Female	36(41.4%)	Female	105(40.4%)	
baby admission to ICU	31(17.9%)		14(14.9%)		45(17.4%)		0.88
Reasons for admission (within the babies who were admitted to NICU)	RDS	5(22.7%)	RDS	4(33.3%)	RDS	9(26.5%)	NA
	Congenital abnormality	4(8.3%)	Congenital abnormality	1(8.3%)	Congenital abnormality	5(14.7%)	
	Meconuim stained	2(9.1%)	Meconuim stained	1(8.3%)	Meconuim stained	3(8.8%)	
	Preterm	7(31.8%)	Preterm	3(25%)	Preterm	10(29.4%)	
	Jaundice	2(9.1%)	Jaundice	3(25%)	Jaundice	5(14.7%)	
	Amphiline	2(9.1%)	Amphiline	0(0%)	Amphiline	2(5.9%)	
RDS	9(5.2%)		5(5.8%)		14(5.4%)		1
use of ventilator for the baby	8(4.6%)		3(3.5%)		11(4.2%)		1
baby death	6(3.5%)		1(1.2%)		7(2.7%)		0.43

NA means p value was not reported

uterine rupture, hysterectomy, DVT, pulmonary embolism, maternal mortality and admission to ICU between the two groups. For more details, see Table 1 and Table 2.

An independent t-test was conducted for continuous variables to compare the gestational age in weeks, birth weight in kilograms, APGAR score at first minute, APGAR score at five minutes, and length of stay at NICU for women who had 3CS and women who had 4CS and more. There was a significant difference in gestational age for three CS (M=37.3, SD=1.4) and more than three CS (M=36.8, SD=1.7; t(259)= 2.29, p= 0.02). On the other hand, there were no significant differences in birth weight, APGAR score at one and five minutes and length of stay between the two groups (three CS and four CS and more). For more details, see Table 3.

A none parametric test, chi-square tests were conducted for categorical variables to compare the gender of the baby, baby admission to NICU, reasons for admission to NICU, respiratory distress syndrome (RDS), use of ventilator and baby death for women who had three CS and women who had four CS and more.

Findings showed that, there were no significant differences in babies' gender admission to NICU, reasons for admission to NICU, RDS, use of ventilator and baby death between the two groups (3CS and 4CS and more) proportions. For more details, see Table 4.

Second twin findings

There were six second twin babies within the two groups (five in the previous three CS group and one in the four CS and more group). Second twin's gestational age, birth weight, and APGAR score at one and five minutes' data were not appropriate for inferential statistics, as they were just five babies and there was only one baby in the more than four CS group. None of the second twins (three babies in each group) developed respiratory distress syndrome (RDS), required ventilator or died. However, one second twin baby from the previous three CS group was admitted to neonatal intensive care unit (NICU).

Discussion

This is new data for Jordan and provides a much needed benchmark on birth outcomes for repeated CS for the government. Despite the latest medical advances in the safety of anesthesia, pre- and post-operative monitoring, antibiotic use, and the accessibility of blood and blood products, repeated CS causes serious maternal and neonatal morbidities and mortalities, as evidenced in this paper.

Results showed that the rate of three and more repeated CS from the total CS in both hospitals was 1.4% (261). Further analysis showed that Bade'a hospital had a higher proportion (37%) of four or more previous CS than KAUH (30.8%). This could be explained by the fact that Jordanian women (who have less money) might have their subsequent CS at Bade'a hospital because it is cheaper than KAUH.

The literature reports an increased need for blood transfusion proportionate to the number of repeated CS and this was evident in this data. Here the proportion of women who had four CS received more blood transfusions than women who had three previous CS, but the amount of blood in millilitres was not significantly different between the two groups. This might be because women who had four CS or more had greater blood loss, resulting in anemia. Our findings are consistent with previous studies, which reported that the need for blood transfusion is increasing with the increasing number of previous CS (Waqarunissa et al, 2016; Gedikbasi et al, 2010; Alchalabi et al, 2007; Silver et al, 2006).

Our results were consistent with previous national and international studies in terms of maternal age and parity, which were higher in women with four CS and more (Amarin et al, 2006; Silver et al, 2006). This is probably because older women have more pregnancies, as the culture expects them to have a large family. However, this was not applicable to the gestational age. Our results showed lower mean gestational age in women who had four CS and more. These findings are in keeping with those reported by Gedikbasi et al (2010) and Alchalabi et al (2007).

Women need to be informed about the risks of repeated CS and should have appropriate counselling. Women that have undergone a previous CS should be identified as high risk pregnant women because of the risk of placenta praevia and should be warned of the increased risk of hysterectomy. Our findings showed that women who have undergone four CS and more were more likely to have placenta praevia. These findings were in keeping with those of Amarin et al, (2006) who found that there was an increase incidence of placenta praevia in relation to a higher number of previous CS (n=41, 4.1%), and is congruent with the work undertaken by Silver et al, (2006) and Gedikbasi et al, (2010). Furthermore, they are consistent with Marshall et al (2011), who reported in their systematic review and meta-analysis of 21 observational studies that the incidence of placenta praevia increased from 10/1000 deliveries with one previous CS delivery to 28/1000 with three or more CS deliveries. The literature has demonstrated a correlation between the number of previous CS and the risk for hysterectomy (Marshall et al, 2011; Tulandi et al, 2009; Ma et al, 2009; Nisenblat et al, 2006; Silver et al, 2006).

The authors' non-significant findings showed consistency with those reported by Marshall et al, (2011). They calculated the rate of hysterectomy and compare it with the previous local studies from Jordan, the rate of hysterectomy in our study was 18 out of 265 (6.8%), which is higher than rates reported by Amarin et al (2006). Their findings showed that nine women had hysterectomy (n=9 out of 989, 0.9%). It also was higher than the rate reported by Alchalabi et al (2007) where seven out of 679 women with previous CS had a hysterectomy (n=7 out of 679, 1.0%).

Fortunately, there was no single incidence of placenta accrete, although this result contradicts previous investigators (Marshall et al, 2011; Alchalabi et al, 2007; Amarin et al, 2006; Silver et al, 2006). The percentage of women with adhesions increased with each subsequent CS. This can lead to difficult subsequent surgery, which may be particularly relevant to women who gave birth with repeated CS, as it prolongs the operation time and increases the risk of injury to adjacent organs (Lyell, 2011). The findings of this study showed that 42 women had adhesion (15.8%), the percentage was higher in women who had four CS and more (20%) compared to women who had previous three CS (13.7%). These findings are in keeping with the previous work done by Gedikbasi et al (2010); Alchalabi et al,(2007); and Silver et al (2006).

The authors recommend that policy-makers implement a 'vaginal birth after previous caesarean delivery versus elective repeated caesarean section (ERCS)' checklist or clinical care pathway to facilitate best practice in antenatal counselling (RCOG, 2015). Women who have had two or more prior lower segment CS deliveries should be offered VBAC after counselling by a senior obstetrician. For practice we recommend that early recognition of placenta praevia, adoption of a multidisciplinary approach, and informed consent are important considerations in the management of women with placenta praevia and previous caesarean delivery (Clark et al, 2015; RCOG, 2015).

Conclusion

One major limitation of this study is the time frame for data collection, which is only five years. It would be more significant if data were collected for a longer period. However, this was beyond our control, as one of the hospitals does not keep health records for more than five years due to space limits for paper storage; the second hospital uses electronic health information system. As the researchers sought to have a representative sample from the two settings which are similar in their major characteristics, the decision was to collect data for the five year period from both hospitals.

These findings lead us to conclude that multiple repeated CS might carry specific additional risk for mother and the baby. Repeated caesarean section might increase the frequency of maternal morbidity but not the frequency of neonatal morbidities.

Jordan should set a priority for decreasing the rate of repeated CS as a national goal. An expanded use of trial of labor and vaginal birth after a prior CS should be implemented (RCOG, 2015, Clark et al, 2015).

Appropriate counselling for women with previous CS should be provided in which women should informed not only about the risks of trial of labour but also the risks associated with multiple repeated CS. Women need to be well informed about the morbidity for mother and baby from repeated CS (Clark et al, 2015).

For women who desire to have a lot of children, a VBAC attempt need to be encouraged as it decreases the total number of hysterectomies performed.

References

Abu-Heji A, Zayed F. (1998) Primary and repeated caesarean sections: comparison of indications. *Journal of Obstetrics and Gynaecology* **18**: 432-4.

Al Rifai R. (2014) Rising caesarean deliveries among apparently low-risk mothers at university teaching hospitals in Jordan: analysis of population survey data, 2002-2012. *Global Health Science and Practice* **2(2)**: 195-209.

Alchalabi HA, Amarin ZO, Badria LF, Zayed FF. (2007) Does the number of previous caesarean deliveries affect maternal outcomes and complication rates? *WHO EMRO-Eastern Mediterranean Health Journal* **13(3)**: 544-550.

Amarin Z, Alchalabi H, Khder Y, Gharaibeh A, Shwayat R. (2006) Variations in repeated caesarean section complication rates among 3 hospitals in northern Jordan? *WHO EMRO-Eastern Mediterranean Health Journal* **12(5)**: 610-617.

Clarke M, Savage G, Smith V, Daly D[illegible]ne D, Gross MM, M,... Begley C. (2015). Improving the organisation of maternal health service delivery and optimising childbirth by increasing vaginal birth after caesarean section through enhanced women-centred care (OptiBIRTH trial): study protocol for a randomised controlled trial (ISRCTN10612254). *Trials* **16**: 542. See: http://doi.org/10.1186/s13063-015-1061-y (accessed 7 February 2017).

El-Zanaty F, Way A. (2009). *Egypt demograp[illegible]d health survey 2008*. Ministry of Health, El-Zanaty and Associates, and Macro International: Cairo, Egypt.

Gedikbasi A, Akyol A, Bingol B, Cakmak D, Sargin A, Uncu R, Ceylan Y. (2010) Multiple repeated caesarean deliveries: operative complications in the fourth and fifth surge in urgent and elective cases. *Taiwan J Obstet Gynecol* 49(4): 425-431.

Guise JM, Eden K, Emeis C, Denman MA, Marshall N, Fu RR, Janik R, Nygren P, Walker M, McDonagh M. (2010) Vaginal birth after caesarean: new insights on maternal and neonatal outcomes. Evidence Report technology assessment (full report). 191:1-397 See:DOI:10.1097/AOG.0b013e3181df925f [PubMed (accessed 6 May 2016).

Gungorduk, K; Asicioglu,O. Celikkol, S; Sudolmus, S ;& Ark, C . (2010) Iatrogenic bladder injuries during caesarean delivery: a case control study. Journal of Obstetrics and Gynaecology 30(7): 667–670. See: 10.3109/01443615.2010.486086. (accessed 3November 2016).

Hamel K. (2007) Incidence of adhesions at repeat caesarean delivery, American Journal of Obstetrics & Gynecology e31-32.

Liang-kun Ma, Na Liu, Xu-ming Bian, Li-rong Teng, Hong Qi, Xiao-ming Gong, Jun-tao Liu, Jian-qiu Yang. (2009) Pregnancy outcomes of repeat caesarean section in Peking Union Medical College Hospital. Chinese Medical Sciences Journal 24 (3): pp 147-150.

Lumbiganon P1, Laopaiboon M, Gülmezoglu AM, Souza JP, Taneepanichskul S, Ruyan P, Attygalle DE, Shrestha N, Mori R, Nguyen DH, Hoang TB, Rathavy T, Chuyun K, Cheang K, Festin M, Udomprasertgul V, Germar MJ, Yanqiu G, Roy M, Carroli G, Ba-Thike K, Filatova E, Villar J. (2010) Method of delivery and pregnancy outcomes in Asia: the WHO global survey on maternal and perinatal health 2007-08. Lancet 6;375 (9713): 490-9. doi: 10.1016/S0140-6736(09)61870-5. See: https://www.ncbi.nlm.nih.gov/pubmed/20071021 (accessed 30June 2016)

Lyell, D (2011) Adhesions and perioperative complications of repeat caesarean delivery. American Journal of Obstetrics & Gynecologyvol issue pages See: www.AJOG.org s11-s18. (accessed 10 November 2016).

Marshall N.E, Fu R, Guise J M. (2011) impact of multiple caesarean deliveries on maternal morbidity: A systematic review. Am J Obstet Gynecol 205(3): e1-8.

Martin J A, Hamilton BE, Ventura SJ, Osterman MJK, Wilson EC Mathews MS. Division of Vital Statistics. (2012) Births: final data for 2010. National Vital Statistics for USA Report 61 (1)See: http://www.cdc.gov/nchs/data/nvsr/nvsr61/nvsr61_01.pdf.

Nisenblat V, Barak S, Griness O B, Degani S, Ohel G, Gonen R. (2006) Maternal complications associated with multiple caesarean deliveries. Obstet Gynecol 108(1):21-6.

Potter J E, Hopkins K, Faundes A, Perpetuo I. (2008). Women's autonomy and scheduled caesarean sections in Brazil: a cautionary tale. Birth, 35(1), 33-40.

Rahman J, AL-Ali M, Qutub H O, AL-Suleiman S S, AL-Jama F E, Rahman M S. (2008) Emergency obstetric hysterectomy in a university hospital: A 25-year review. Journal of Obstetrics and Gynaecology 28(1): 69 – 72.

Rashid M, Rashid R. (2004) Higher order repeat caesarean sections: how safe are five or more? BJOG: an International Journal of Obstetrics and Gynaecology Vol. 111, pp. 1090–1094 DOI: 10.1111/j.1471-0528.2004.00244.x

Royal College of Obstetricians and Gynaecologists (RCOG) (2015) Birth After Previous Caesarean Birth. Green-top Guidelines No. 45. Royal College of Obstetricians and Gynaecologists (RCOG). See: https://www.rcog.org.uk/guidelines (accessed 12 December 2016).

Silver RM, Landon MB, Rouse DJ, Leveno KJ, Spong CY, Thom EA, Moawad AH, Caritis SN, Harper M, Wapner RJ, Sorokin Y, Miodovnik M, Carpenter M, Peaceman AM, O'Sullivan MJ, Sibai B, Langer O, Thorp JM, Ramin SM, Mercer BM, for the National Institute of Child Health and Human Development Maternal-Fetal Medicine Units Network. (2006) Maternal morbidity associated with multiple repeat caesarean deliveries. Obstetrics& Gynecology Vol.107, (6):1226–32.

The World Bank (2016). Jordan Economic Monitor: reviving a slowing economy See: http://www.worldbank.org/en/country/jordan/overview (accessed 4 August 2016).

Tulandi T, Agdi M, Zarei A, Miner L, Sikirica V. (2009) Adhesion development and morbidity after repeat cesarean delivery. American Journal of Obstetrics& Gynecology 201:56 e1-6.

Waqarunissa A, Fkharunissa W, Qamarunissa M, Raheela B. (2016) Maternal complications in repeated Caesarean section. Innovative Journal of Medical and Health Science, [S.l.], v. 6, n. 2, apr. 2016. ISSN 2277-4939. See: at http://innovativejournal.in/ijmhs/index.2016 (accessed 14 September2016).

WHO Global Health Observatory (GHO) (2015) Data for the years 1990-2015. See: http://www.who.int/gho/maternal_health/countries/en/ (accessed 15 March 2016).

World Health Organization (2015) WHO statement on caesarean section rates, See: at http://www.who.int/reproductivehealth/publications/maternal_perinatal_health/cs-statement/en/

World Health Organization Regional Office for Europe. (1985) Joint Interregional Conference on Appropriate Technology for Birth. WHO: Fortaleza, Brazil.

